construction and fine workmanship may be imagined when the reader is informed that the machines cost 500*l.* a piece to manufacture. The long tube is divided into three compartments: the head, which contains the explosive charge, the reservoir, in which the compressed air is stored, and the machinery by means of which the stored-up energy is converted into a propelling force. The air is compressed to the extent of 600 lbs. on the square inch, and to bring about this result an exceedingly powerful air-pump is necessary, which forms an additional item of expense in the case of this torpedo. The latter when properly charged will do a journey of a mile, or mile and a half, under water, the first 1,000 yards being got over at a rate of no less than twenty miles an hour, and if unaffected by tide or current, the machine will proceed in a perfectly straight direction. It floats at any distance under water that may be desirable, but is usually made sufficiently buoyant to swim at eight feet from the surface; it explodes on striking any object, but the machine is so contrived that if it fails to strike, then it floats to the surface, and a trigger guard renders the fish at the same time innocuous, and permits of its recapture without risk. Ingenious as the little creature is, there has been, we repeat, no authenticated employment of it during the present war.

On the Danube the spar-torpedo alone seems to have been used against Turkish monitors. As in the case of the *Thornycroft* launch, of which we are to have a flotilla of thirty in the British navy, the torpedo is projected at the end of a spar, and is ignited either by concussion or by electricity. The Turkish ironclad at Matchin was the victim of two torpedoes of this class, the first of which, we are told, was ignited by the crew of the launch by electricity, and the other on concussion with the vessel attacked. These Russian torpedoes are said to be innocuous at a distance of ten feet from the seat of explosion, and hence those in the launch do not suffer much except from the water that is thrown into the air. From the fact that small batteries in the boat are used to fire the charges, we may safely conclude that their explosion is brought about by a platinum wire fuze, which, together with a few grains of fulminate, would determine the detonation of dynamite or gun-cotton. Each launch is provided with a pair of these spar torpedoes, carried, when not in action, on each side, running the length of the boat, and only on making an attack is one or other projected at the bow, the torpedoist being stationed behind a shield, or under an iron screen, where he can make his observations tolerably free from danger.

In the case of moored torpedoes depending for their ignition upon electricity, many points of scientific interest have recently been brought to light. Some experiments undertaken in Denmark two or three years ago showed most conclusively that dynamite torpedoes cannot be placed close together without incurring the danger of one charge bringing about the explosion of others. A dynamite torpedo of 150 lbs. ignited in ten feet of water, was found capable of exploding other charges at a distance of 300 feet by the mere vibration imparted to the water; so that in constructing coast defences with dynamite torpedoes it is absolutely necessary to keep them far apart from one another. Another point was also noted. A current of electricity, if it emanates from a powerful frictional electric machine, traversing one of a bundle of wires, will induce a current in the other wires, and thus bring about the explosion of torpedoes other than that which the operator on shore desires to ignite. It is these facts particularly which have led to the development of a system of counter-attack and have enabled our sailors to devise a means of defending themselves from the terrible sea-monsters. Both dynamite and gun-cotton are peculiarly sensitive to vibration—indeed their detonation, as we have seen, is brought about by no other cause—and hence a captain of a man-of-war by exploding counter-mines in his vicinity may soon get rid of any lurking torpedoes lying in wait for him, at any rate if they contain a nitro-glycerine compound, and so speedily clear a way for his ship.

This is certainly subject for congratulation, for it seemed at one time as if the poor sailor was absolutely defenceless against these submarine abominations. A crinoline of spars and wire rope may be employed to catch the fish torpedo and explode the vermin harmlessly in its toils, provided the ingenious brute is not a very large one, and the net is at some distance from the ship; but heavy moored torpedoes have been hitherto considered too dangerous to approach, so that marine countermining must prove invaluable. The spar or drifting torpedo cannot be dealt with by nets or booms alone, and in this case the only plan would seem to be to meet attack with attack and beat off launches with other small boats. That all ironclads in time of war will have to be surrounded by lesser craft as a protection is a matter that we may now take for granted, as also that such vessels must be provided with some powerful means of illumination—the electric light, for instance—to prevent swift, low-lying torpedo launches from approaching unperceived at night time.

Special schools of instruction for acquainting officers with the science of electricity and explosives have for some time past been established, and there is indeed scarcely a naval power which has not paid attention to submarine warfare; consequently we may expect to see future battles upon the sea carried on just as much under water as above it. In this country we have a torpedo school on board H.M.S. *Vernon* at Portsmouth, while at the Royal Naval College at Greenwich instruction in the experimental sciences now forms one of the most important items in the curriculum. France has its naval torpedo school at Boyardville, where both officers and seamen are made acquainted with the principles of submarine warfare. Germany, as all the world knows, practised torpedo warfare to such good purpose seven years ago that the magnificent fleet of the French never once ventured to visit the coast of the Fatherland. Both at Kiel and at Wilhelmshaven are to be found torpedo depôts and a well-organised staff of instructors. Lastly the news comes to us from Russia that the Czar has sanctioned the organisation of a distinct torpedo service, and two depôts and instructional schools are to be formed at Kertch and Cronstadt, whence torpedo appliances are to be issued for the defence of the Baltic and the Black Sea.

NOTES

MR. DARWIN will receive the honorary degree of LL.D. at Cambridge on Saturday next, at 2 P.M., at a congregation specially convened for the purpose. In the evening the annual dinner of the Philosophical Society will take place in the Hall of Clare College, when a brilliant gathering is expected to meet the illustrious visitor, among the non-resident guests being Profs. Huxley, Tyndall, and Parker, and Sir John Lubbock.

THE Postmaster-General of the German Empire is about to have an extensive series of experiments made with a view to the introduction of the telephone into the telegraphic service. Several hundred specimens of the telephonic apparatus manufactured by Siemens and Halske have been ordered.

THE French Ministry had granted a pension to the widow of Leverrier. Unfortunately the lady died, as we mentioned in our last number, before the first monthly instalment became due. It is hoped that a part of the pension will go, against ordinary rules, to the son and daughter of the astronomer.

THE Minister of Public Instruction has been authorised by a decree of the President of the French Republic to accept a sum of 8,000*l.*, bequeathed by Madame Thuret, in order to establish at Antibes, in the Department of Alpes Maritimes, an agricultural station connected with the lectureship on Agriculture and Botany of the Paris Museum of Natural History.

MR. PARK HARRISON has completed the exploration of the galleries belonging to the "Cave Pit" at Cissbury—in which rune-like characters were found in 1875—and found that they communicate with galleries connected with other shafts, at distances of from 20 to 30 feet, on the north, west, and east sides. Mr. Harrison thinks there appears to be sufficient evidence that they were used for purposes of shelter or concealment long after they were originally excavated. One of the shafts last cleared out, was found to have been left in an incomplete state, as if the work had been for some reason interrupted. On the south of the cave pit, and immediately adjoining it, Mr. Harrison has discovered several small pits, the largest being 5 feet in diameter, and 4 feet 6 inches deep. All contained flint flakes, sling-stones, and a few bones. In some there were small ornaments, pots of good quality, bone combs, terra-cotta beads, and hard polishing-stones. In one pit there was an iron hook.

THE following testimony from so competent and disinterested an observer as Prof. Monier Williams to the necessity for systematic meteorological observation in India is valuable, and we hope will have weight with the proper authorities. In the last of his series of articles on his second tour in India, in the *Times* of November 7, Prof. Williams writes thus :—"One thing requires instant attention. The connection between agriculture, meteorology, and astronomy is now admitted on all hands, and no country in the world would be benefited more than India by systematic meteorological and astronomical observations carried on under Government direction. Much is already being done in this way. Yet I could only find one effective astronomical observatory, and that not adequately supported by Government, though I travelled from Cashmere to Cape Comorin. It is not generally known that from his observations of the present condition of the disc of the sun, in connection with various atmospherical phenomena, the Madras astronomer, Mr. Pogson, prophesied in 1876 a recurrence of the drought and famine in 1877."

ON October 24, we learn from *L'Exploration*, Signor D'Albertis and Prof. Od. Beccari left Genoa in the steamer *Australia* for a year's voyage round the world. They will first visit Egypt, and thence to India, China, and Japan, returning to Europe by New York. They intend to collect during their voyage birds, mammals, and insects for the museums of Italy, principally for that of Genoa.

FOR several years past Major J. W. Powell, in charge of the United States Geographical and Geological Survey of the Rocky Mountain Region, has been paying particular attention in his researches, to the ethnology and philology of the American Indians; and having received from the Smithsonian Institution an immense mass of material on this subject, collected during a period of many years, he has called to his assistance numerous experts for the purpose of preparing a series of memoirs on these topics. We have now a partial result of his labour in the first of a series of quarto volumes, entitled "Contributions to North American Ethnology," and published in most excellent style, with numerous illustrations, at the Government Printing-office. The present volume is occupied with the Indians of North-western America, embracing several papers by Mr. Dall and others on the tribes of Alaska and adjacent territories, and a number of vocabularies, principally by the late Mr. George Gibbs.

OUR readers may remember that last spring Capt. Burton made an expedition into the Land of Midian, which lies to the south-east of the Gulf of Akaba, in the Red Sea. He was accompanied by a mining engineer, M. Marie, and the two explorers came upon traces of extensive mining operations, the ruins of ancient towns, and many other evidences of a flourishing mining district. They brought back specimens containing gold, silver, copper, and other metals, and were most sanguine as to their discovery. Capt. Burton is now again in Egypt, the *Times*' Alexandria correspondent writes, preparing another expedition to Midian. He is now determined to investigate thoroughly that biblical country of which he only got a superficial idea in his twenty-day visit last spring. His intention now is to penetrate to the mountains in the interior, and thoroughly satisfy himself as to their nature and capabilities. He estimates the distance under twenty days' march. It is a curious fact that these mines were known to the ancients so long ago as the time of Ramses III., whose cartouche is inscribed on the Needle which is on its way to England. In the Harris Papyrus in the British Museum is a passage referring to the copper mines of Akaba.

AT the last meeting of the Russian Geographical Society, the Secretary gave some account as to this year's expeditions sent out by the Society. The results of Prshevalsky's expedition are a survey from Kuldja for 800 miles into the interior of the country, seven determinations of latitudes and longitudes, many barometrical measurements of heights along the route, a botanical collection of about 300 species, a zoological collection, numbering 85 mammalia, 180 species (500 specimens) of birds, 50 specimens of fishes, 150 reptiles, and 2,000 insects. The most important objects in the collection are four skins of wild camels. All the collections are now in Kuldja, and will be forwarded to St. Petersburg during the winter. About the end of August M. Prshevalsky had started for Tibet. M. Potanin has returned without having penetrated far into the interior of Mongolia. He proposes now to go to the sources of the Yenissei. M. Mainoff has returned from his travels among the Mordva population of Eastern Russia with very valuable materials. He has obtained anthropological measurements according to the 126 queries of the programme, of 510 individuals, and he brings detailed answers on the queries of the programme as to the ethnographical and juridical customs of the Mordva, as well as numerous skulls, photographs, tools, and dresses.

A RAILWAY official in Berlin was lately fined by the district courts for appending to his name the title of *doctor juris utriusque*, on the strength of a diploma from the University of Philadelphia. An appeal to a higher court resulted in a confirmation of the sentence.

WE notice a very useful Russian work, just published by the St. Petersburg Committee of Primary Education, being a review of all works that have appeared in Russia in the department of primary instruction. The book, 640 pages, gives a complete catalogue of such works, with critical notices on each of any importance, and it is sold at a very low price, for the use of primary teachers.

A YOUNG schoolmistress of Tlemcen (Algeria) has successfully passed her examinations before the Faculty of Aix for Baccalaureate in Letters, and has been warmly congratulated by the Board.

THE statue of Lagrange, the celebrated mathematician, born in Italy, but a naturalised Frenchman, was erected last week in the hall of the Bureau des Longitudes.

AT a recent meeting of the Paris Academy of Sciences a letter from M. Fabre to M. Dumas was read, referring to an American vine which he had cultivated for a long time in the very heart of phylloxeric centres, but which has escaped the least sign of infection. It flourishes under the most unfavourable circumstances, grows rapidly, and readily receives grafts from French vines.

THE French Association Polytechnique, created in 1830, has just published its programme for 1877-1878. Lectures are given by this institution to working men in each of the twenty municipal districts of Paris, and in almost every manufacturing district of France. For the first time the programme of lectures is uniform, and special text-books are published at a cheap rate under its authority. No salaries are given to teachers, and no fees taken from pupils. It is called "La Sorbonne de l'Ouvrier." All expenses are covered by voluntary contributions. M. Dumas, the perpetual secretary of the Institute has been elected president of the Association. He has filled this important position for a number of years.

THE *Jardin d'Acclimatation* of Paris, as we recently stated, has received a family of Esquimaux, who are quartered alongside the Nubians, who were recently in London. They consist of three men, a woman, and two children, and have charge of a collection of phocas, white bears, and trained dogs. The customary Esquimaux huts have been erected for their accommodation, and their time is spent in the ordinary occupations to which they are accustomed in the Polar regions. The *Société d'Anthropologie de Paris* has appointed a commission to study these unusual visitors, consisting of Dr. Broca, president, and MM. Bordier, Dolly, Girard de Rialle, Mazard, and Topinard.

THE Ministry of Public Instruction has just established, in Paris, a "Bibliothèque Universitaire," containing all works appearing from the pens of the professors of the French University.

AMONG the medals awarded by the Photographic Society in connection with their Exhibition, are one for the best microphotograph, "Proboscis of a Blowfly," to Mr. Edward Viles, and a special medal to Mr. W. J. A. Grant for his Arctic Views.

THE Institution of Civil Engineers resumed its meetings on Tuesday. Among the papers announced to be read early in the session are, a "Review of the Progress of Steam Shipping during the last Quarter of a Century," by Mr. Alfred Holt, M. Inst. C.E. of Liverpool, whilst the latest development of electrical invention and its application to lighting purposes, will be discussed in a paper by Dr. Paget Higgs and Mr. Brittle, Assocs. Inst. C.E., entitled "Some Recent Improvements in Dynamo-Electric Apparatus."

THE fourth annual meeting of the Dundee Naturalists' Society was held recently. Mr. Grothe, the president, occupied the chair. The secretary read the council's report for the past year, which showed that it had been one of great activity and prosperity. The year began with a membership, including all classes, of 232, but at the date of the report this number had increased to 401, being an increase of 169. The property of the society had also been considerably increased during the year, chiefly by gifts of books and specimens for the society's museum. During the last winter nine original papers had been read by members at the ordinary meetings of the society, treating of geological, biological, physical, and archæological subjects. During the summer the interest in, and work of, the society was kept alive by a series of very attractive excursions. One excursion was a sea-dredging expedition, and opened up for the society a new field for its energies. In order to secure a more exhaustive and systematic treatment of the various branches of natural science, the society was formed into sections, three in number, viz.:—1. Physical and Chemical; 2. Geological; 3. Biological. From this arrangement it is hoped that much good will result. The society is in a very healthy and vigorous condition.

THE following modification of an experiment of Prof. Tyndall's is described by M. Terquem in the *Journal de Physique* for October. A trumpet-bell connected by a thick caoutchouc tube with one of König's manometric flames, is fixed vertically over a square plate, which is vibrated so as to give two nodal lines as in Tyndall's experiment. If the axis of the bell be placed exactly over the centre of the plate, the flame remains quite motionless, and the same if the bell be placed above a nodal line. On the other hand, the flame vibrates when the bell is displaced, however little, and the vibrations become very strong when the bell is placed above a ventral segment. With two similar trumpet-bells placed over two ventral segments having similar, or contrary movements, the vibrations may be united on a single flame, by means of a Y-tube, a drawing-tube being placed in the passage of one of the vibratory movements. The advantage of this arrangement consists in producing very strong separate vibrations; moreover, it is possible to give them exactly the same intensity by displacing laterally one of the bells. To obtain absolute motionlessness in the flame the two combined movements must have exactly the same amplitude. To render the flame more brilliant M. Terquem passes the gas through pumice-stone soaked with benzine or the like, and incloses the jet in a tube through which a current of oxygen is sent. A cylinder of mica blackened interiorly, except on the side next the revolving mirror, surrounds the flame.

A RECENTLY-PUBLISHED report by the Criminal Administration of France gives some curious statistics with regard to suicides in 1874. There were in that year 5,617 suicides, the highest number ever recorded in the country. Of these 4,435 (79 per cent.) were committed by men, and 1,182 (21 per cent.) by women. The ages of 105 of the suicides are unknown. The 5,512 others are thus divided:—Minors of 16 years, 29; 16 to 21 years of age, 193; 21 to 40, 1,477; 40 to 60, 2,214; and beyond 60, 1,599. Among the suicides there are enumerated 1,946 celibates (36 per cent.), 2,645 (48 per cent.) were married, and 881 (16 per cent.) were widowed. Of the number of those forming the last two categories there were 2,259, or nearly two-thirds, who had children. The civil state of 145 individuals could not be ascertained. More than seven-tenths of the suicides were by strangulation (2,472), or by submersion (1,514). The suicides were, as always, more frequent in spring (31 per cent.) and in summer (27 per cent.) than in winter (23 per cent.) and in autumn (19 per cent.). As to the motives, there is no information about 481 of the suicides; the others are classed as follows:—Misery and reverses of fortune, 652; family troubles, 701; love, jealousy, debauchery, misconduct, 815 (of which 572 were brought about by drunken habits); physical sufferings, 798; various troubles, 489; mental maladies, 1,622; suicides of persons guilty of capital crimes, 59.

AT the meeting of the Eastbourne Natural History Society, of October 19, Mr. Roper read an important paper on "The Addition to the Flora of Eastbourne since 1875."

THE additions to the Zoological Society's Gardens during the past week include a Tiger (*Felis tigris*) from China, presented by Mr. A. Forbes Angus; a Macaque Monkey (*Macacus cynomolgus*) from India, presented by Mr. H. W. Henderson; a Saker Falcon (*Falco sacer*) from Egypt, presented by Mrs. Arthur Coote; two Grey Plovers (*Squatarola helvetica*), a Ringed Plover (*Œgialitis hiaticula*), a Dunlin (*Tringa cinclus*), European, presented by Mr. F. Cresswell; a Californian Quail (*Callipepla californica*) from California, presented by Mrs. A. H. Jamrach; a Ring Hals Snake (*Sepedon hæmachates*) from South Africa, presented by Mr. Eustace Pillans; a Brown Pelican (*Pelecanus fuscus*) from West Indies, a Cape Zorilla (*Ictonyx zorilla*) from South Africa, purchased; five Reindeer (*Ranifer tarandus*) from Lapland, deposited; a Cape Buffalo (*Bubalus caffer*) from South Africa, received in exchange.